

APT60D120SG
Datasheet
Ultrafast Soft Recovery Rectifier Diode

Final
June 2018



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1 Revision History

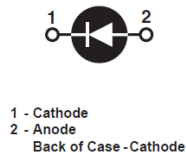
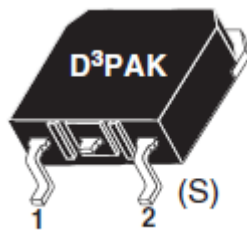
The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Revision A

Revision A was published in June 2018. It is the first publication of this document.

2 Product Overview

This section outlines the product overview for the APT60D120SG device.



2.1 Features

The following are key features of the APT60D120SG device.

- Ultrafast recovery times
- Soft recovery characteristics
- Low forward voltage
- Low leakage current
- RoHS compliant

2.2 Benefits

The following are benefits of the APT60D120SG device.

- Low switching losses
- Low noise (EMI) switching
- Cooler operation
- Higher reliability systems
- Increased system power density

2.3 Applications

The APT60D120SG device is designed for the following applications.

- Power factor correction (PFC)
- Anti-parallel diode
 - Switchmode power supply
 - Inverters
- Freewheeling diode
 - Motor controllers
 - Converters
 - Inverters
- Snubber diode

3 Electrical Specifications

This section details the electrical specifications for the APT60D120SG device.

3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the APT60D120SG device.

All Ratings: $T_c = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Table 1 • Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_R	Maximum DC reverse voltage	1200	V
V_{RRM}	Maximum peak repetitive reverse voltage	1200	
V_{RWM}	Maximum working peak reverse voltage	1200	
$I_{F(AV)}$	Maximum average forward current ($T_c = 126\text{ }^\circ\text{C}$, duty cycle = 0.5)	60	A
$I_{F(RMS)}$	RMS forward current	115	
I_{FSM}	Non-repetitive forward surge current ($T_J = 45\text{ }^\circ\text{C}$, 8.3 ms)	540	
T_J, T_{STG}	Operating and storage temperature range	-55 to 175	$^\circ\text{C}$
T_L	Lead temperature for 10 seconds	300	

3.2 Typical Electrical Performance

The following table shows the static electrical characteristics of the APT60D120SG device.

Table 2 • Static Electrical Characteristics

Symbol	Characteristic	Test Conditions	Minimum	Typical	Maximum	Unit
V_F	Forward voltage	$I_F = 60\text{ A}$		2.0	2.5	V
		$I_F = 120\text{ A}$		2.3		
		$I_F = 60\text{ A}, T_J = 125\text{ }^\circ\text{C}$		1.8		
I_{RM}	Maximum reverse leakage current	$V_R = V_R\text{ rated}$			250	μA
		$V_R = V_R\text{ rated}, T_J = 125\text{ }^\circ\text{C}$			500	
C_T	Junction capacitance	$V_R = 200\text{ V}$		60		pF

The following table shows the dynamic characteristics of the APT60D120SG device.

Table 3 • Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Minimum	Typical	Maximum	Unit
t_{rr}	Reverse recovery time	$I_F=1\text{ A}$ $di_r/dt=-100\text{ A}/\mu\text{s}$ $V_R=30\text{ V}$ $T_J=25\text{ }^\circ\text{C}$		38		ns
t_{rr}	Reverse recovery time	$I_F=60\text{ A}$ $di_r/dt=-200\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=25\text{ }^\circ\text{C}$		400		
Q_{rr}	Reverse recovery charge	$I_F=60\text{ A}$ $di_r/dt=-200\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=25\text{ }^\circ\text{C}$		1200		nC
I_{RRM}	Maximum reverse recovery current	$I_F=60\text{ A}$ $di_r/dt=-200\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=25\text{ }^\circ\text{C}$		6		A
t_{rr}	Reverse recovery time	$I_F=60\text{ A}$ $di_r/dt=-200\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=125\text{ }^\circ\text{C}$		470		ns
Q_{RR}	Reverse recovery charge	$I_F=60\text{ A}$ $di_r/dt=-200\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=125\text{ }^\circ\text{C}$		4000		nC
I_{RRM}	Maximum reverse recovery current	$I_F=60\text{ A}$ $di_r/dt=-200\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=125\text{ }^\circ\text{C}$		13		A
t_{rr}	Reverse recovery time	$I_F=60\text{ A}$ $di_r/dt=-1000\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=125\text{ }^\circ\text{C}$		200		ns
Q_{rr}	Reverse recovery charge	$I_F=60\text{ A}$ $di_r/dt=-1000\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=125\text{ }^\circ\text{C}$		6200		nC
I_{RRM}	Maximum reverse recovery current	$I_F=60\text{ A}$ $di_r/dt=-1000\text{ A}/\mu\text{s}$ $V_R=800\text{ V}$ $T_C=125\text{ }^\circ\text{C}$		47		A

The following table shows the thermal and mechanical characteristics of the APT60D120SG device.

Table 4 • Thermal and Mechanical Characteristics

Symbol	Characteristic/Test Conditions	Minimum	Typical	Maximum	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance			0.31	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-ambient thermal resistance			40	
W_T	Package weight		0.14		oz
			4.0		g

3.3 Typical Performance Curves

This section shows the typical performance curves for the APT60D120SG device.

Figure 1 • Maximum Effective Thermal Impedance, Junction-to-Case vs. Pulse Duration

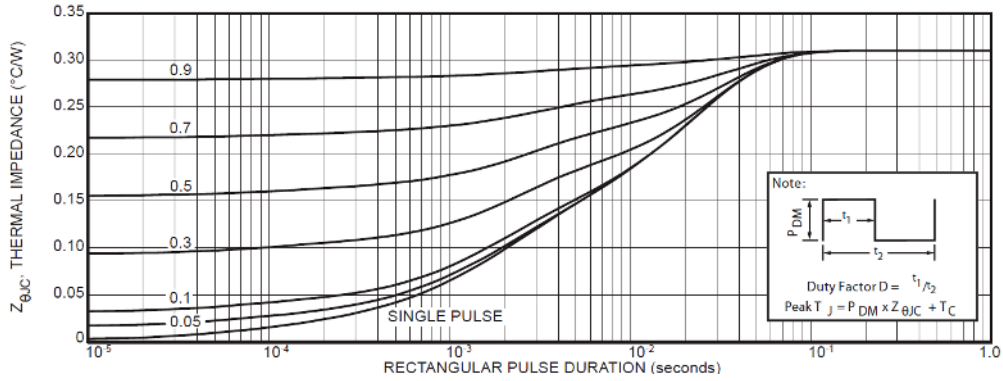


Figure 2 • Transient Thermal Impedance Model

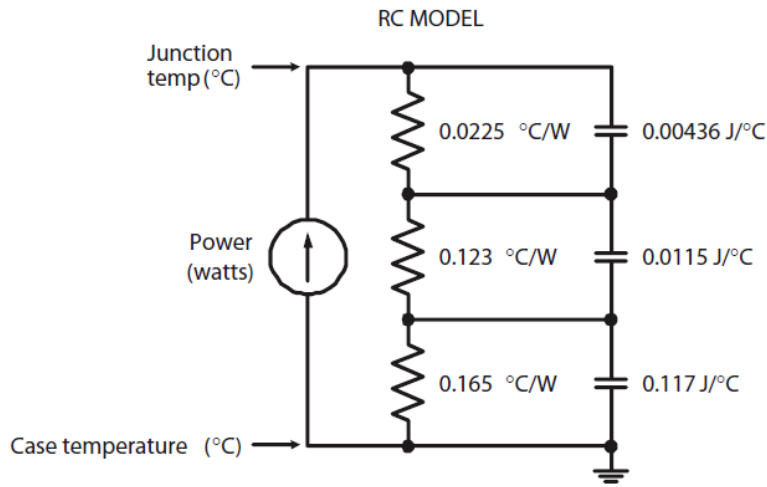


Figure 3 • Forward Current vs. Forward Voltage

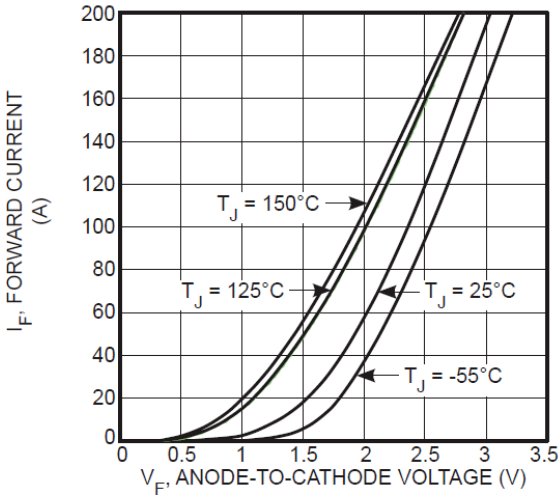


Figure 4 • RRT vs. Current Rate of Change

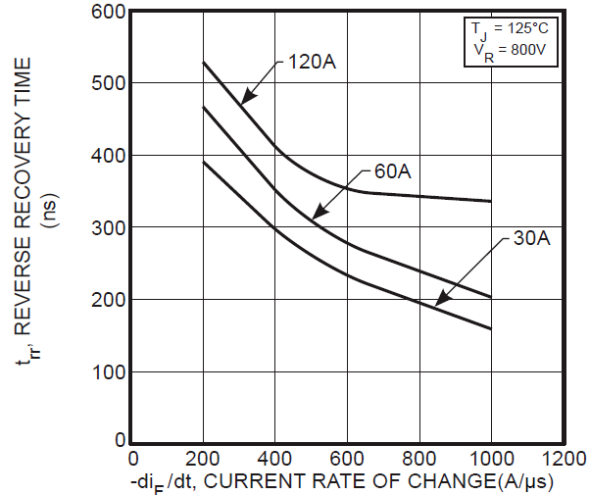


Figure 5 • Reverse Recovery Charge vs. Current Rate of Change

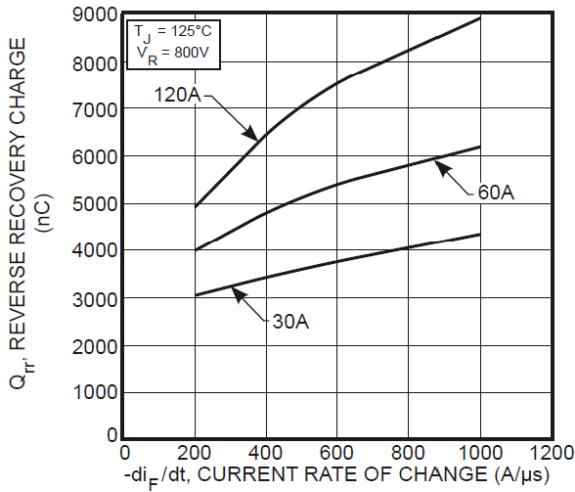


Figure 6 • Reverse Recovery Current vs. Current Rate of Change

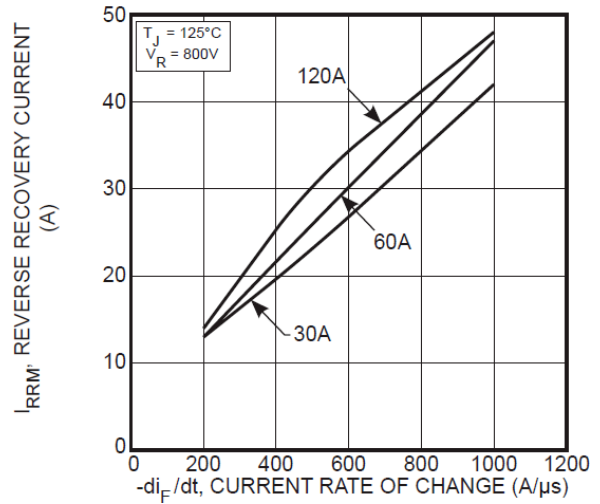


Figure 7 • Dynamic Parameters vs. Junction Temperature

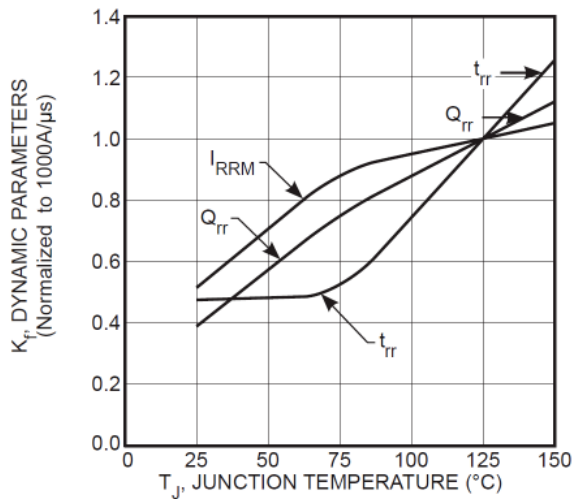


Figure 8 • Maximum Average Forward Current vs. Case Temperature

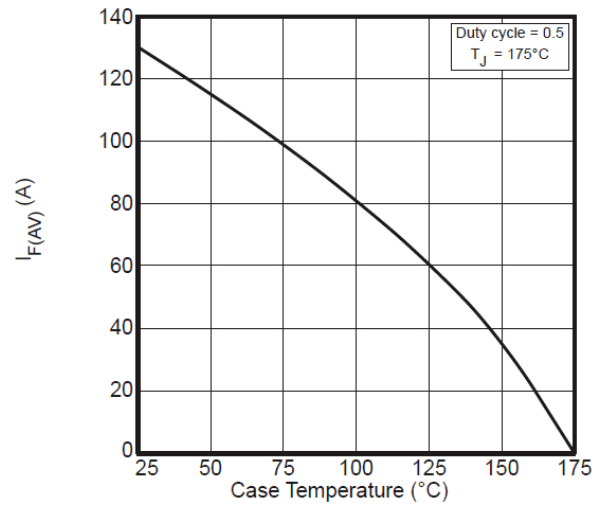
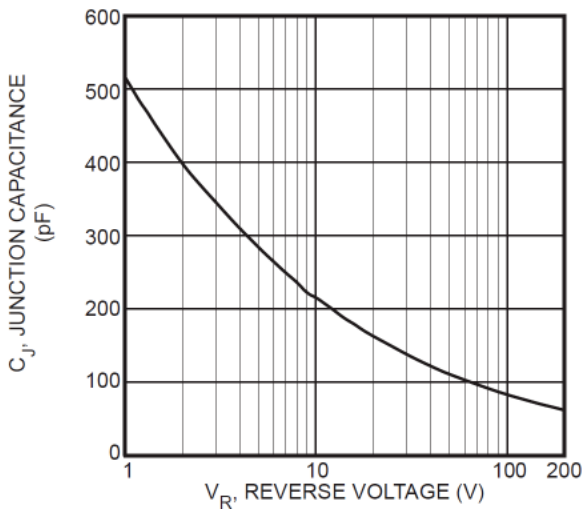


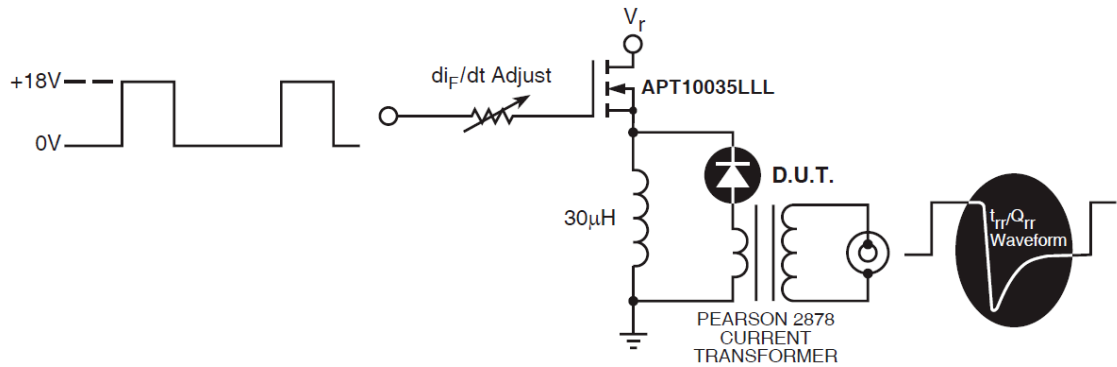
Figure 9 • Junction Capacitance vs. Reverse Voltage



3.4 Reverse Recovery Overview

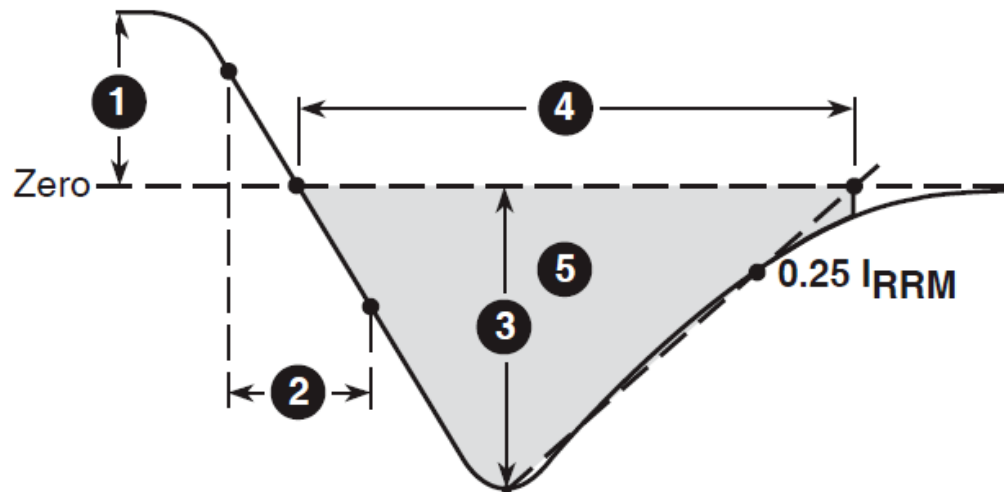
The following figure shows the diode test circuit.

Figure 10 • Diode Test Circuit



The following figure shows the diode reverse recovery waveform.

Figure 11 • Diode Reverse Recovery Waveform and Definitions



1. I_F —Forward conduction current
2. di_F/dt —Rate of diode current change through zero crossing
3. I_{RRM} —Maximum reverse recovery current
4. t_{rr} —Reverse recovery time, measured from zero crossing where diode current goes from positive to negative, to the point at which the straight line through I_{RRM} and $0.25 \cdot I_{RRM}$ passes through zero
5. Q_{rr} —Area under the curve defined by I_{RRM} and t_{rr}

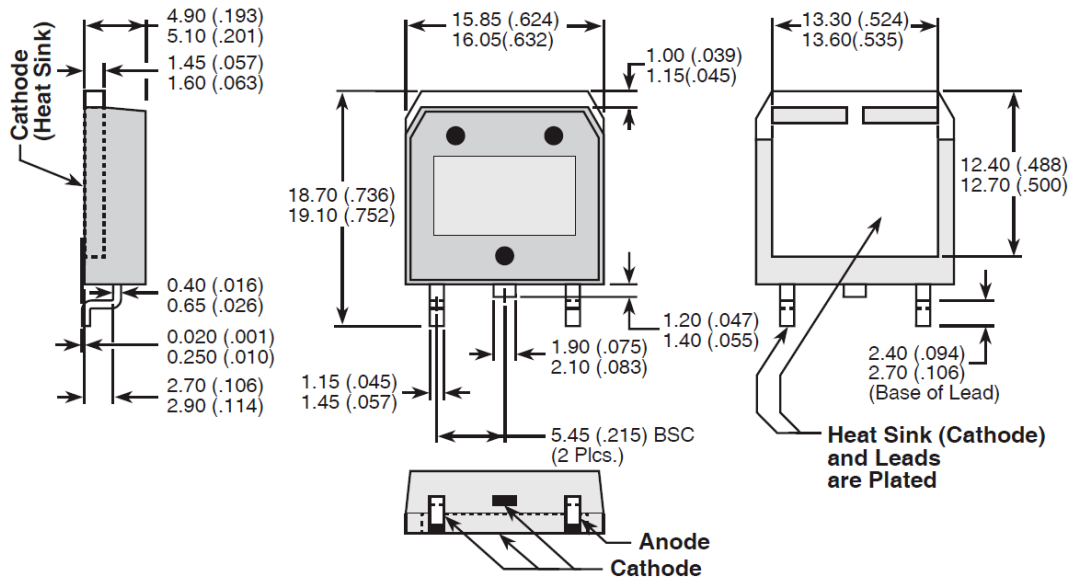
4 Package Specification

This section outlines the package specification for the APT60D120SG device.

4.1 Package Outline Drawing

This section details the D3PAK package drawing of the APT60D120SG device. Dimensions are in millimeters and (inches).

Figure 12 • Package Outline Drawing



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